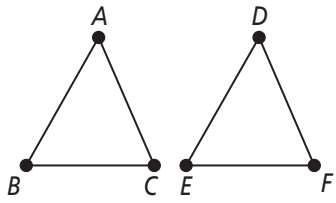
# 9-5 Congruence Transformations

## Vocabulary

### Review

**Look at the congruent triangles.**

$\Delta ABC \cong \Delta DEF$




**1.** Draw line segments to match *corresponding sides*.

| | |
|---|---|
| $\overline{AB}$ | $\overline{DE}$ |
| $\overline{BC}$ | $\overline{DF}$ |
| $\overline{AC}$ | $\overline{EF}$ |

**2.** Draw line segments to match *corresponding angles*.

| | |
|---|---|
| $\angle A$ | $\angle E$ |
| $\angle B$ | $\angle D$ |
| $\angle C$ | $\angle F$ |

### Vocabulary Builder

**Congruent** (noun) KÄη-grü-ənt

**Related Words:** corresponding sides, corresponding angles, side length, angle measure

**Definition:** Two figures are **congruent** if and only if there is a sequence of rigid motions that maps one figure onto the other.

**Example:** If a triangle is transformed by the composition of a reflection and a translation, the image is **congruent** to the given triangle.

### Use Your Vocabulary

**3.** Circle the transformations that make up a glide reflection.

translation reflection rotation dilation

**4.** When a figure is transformed by an isometry, what is true about the corresponding angles and the corresponding sides of the image and preimage?

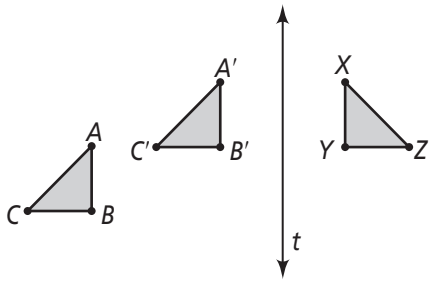
_____

## Problem 1 Identifying Equal Measures

**Got It?** **The composition $(R_t \circ T_{<2,3>})(\Delta ABC) = \Delta XYZ$. List all of the equal angle pairs and all of the equal side lengths.**

**5.** Compositions of isometries preserve angle measure, so corresponding angles have equal measures. Fill in the blanks to make true statements.

$m\angle A = m\angle$ ____ $m\angle B = m\angle$ ____ $m\angle C = m\angle$ ____




**6.** By definition, isometries preserve distance. So, corresponding side lengths have equal measures. Draw line segments to match corresponding side lengths.

| | |
|---|---|
| $AB$ | $YZ$ |
| $BC$ | $XZ$ |
| $AC$ | $XY$ |

take note

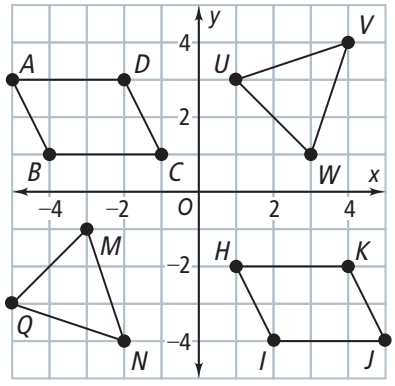
### Key Concept Congruent Figures

Two figures are congruent if and only if there is a sequence of one or more rigid motions that maps one figure onto another.

## Problem 2 Identifying Congruent Figures

**Got It?** **Which pairs of figures in the grid are congruent? For each pair, what is a sequence of rigid motions that map one figure to the other?**

**Underline the correct words to complete each sentence in Exercises 7 and 8.**




**7.** To map parallelogram $ABCD$ onto parallelogram $HIJK$, translate $ABCD$ 2 / 5 / 6 units to the right / left and 3 / 5 / 6 units up / down.

**8.** To map $\Delta UVW$ onto triangle $\Delta QNM$, reflect $\Delta UVW$ across $y = -1$/ 0 / 1. Then translate $\Delta UVW$ 6 units right / left / up / down.

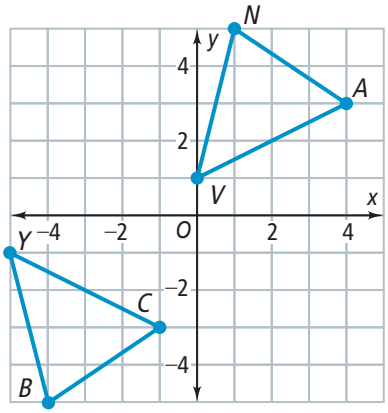
**Fill in the blanks to complete Exercises 9 and 10.**

**9.** Because $T_{<\_\_,\_\_>}(ABCD) = HIJK$, the parallelograms are _____.

**10.** Because $(T_{<\_\_,\_\_>} \circ R_{(y=0)})(\Delta UVW) =$ _____, the triangles are _____.

## Problem 3 Identifying Congruence Transformations

**Got It?** What is a congruence transformation that maps $\triangle NAV$ to $\triangle BCY$?




**Fill in the blanks and underline to complete the statements.**

**Know**

Preimage

$N$ (☐, ☐)

$A$ (☐, ☐)

$V$ (☐, ☐)

image

$B$ (☐, ☐)

$C$ (☐, ☐)

$Y$ (☐, ☐)

**Need**

You need to determine the rigid motion, or sequence of rigid motions, that maps _____ onto _____.

**Plan**

Vertex $N$ corresponds to vertex ☐, vertex $A$ to vertex ☐, and vertex $V$ to vertex ☐. It appears that $\triangle NAV$ has been reflected across the $x$-axis / $y$-axis and then translated ☐ units right / left and ☐ units down.

Use the vertices to verify the congruence transformation.

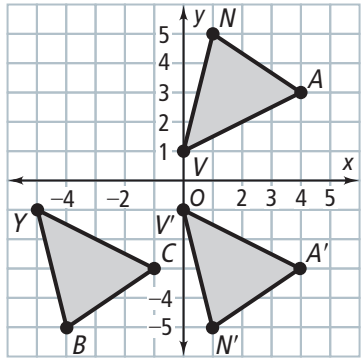
**Fill in the blanks to complete the statements.**

**11.** Verify that the vertex $N$ corresponds to vertex ☐.

$R_{x\text{-}axis}(x, y) = (x, -y)$

$R_{x\text{-}axis}(N) = ($☐, ☐$) = N'$

$T_{<-5,\,0>}(N') = ($☐, ☐$)$ = vertex ☐




**12.** Vertex $A$ corresponds to vertex ☐.

$R$☐$(A) = ($☐, ☐$) = A'$

$T_{<$☐, ☐$>}(A') = ($☐, ☐$)$ = vertex ☐

**13.** Vertex $V$ corresponds to vertex ☐.

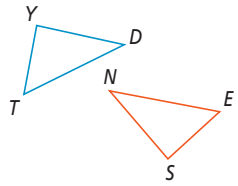
$R$☐$(V) = ($☐, ☐$) = V'$

$T_{<$☐, ☐$>}(V') = ($☐, ☐$)$ = vertex ☐

**14.** Circle the congruence transformation that maps $\Delta NAV$ onto $\Delta BCY$.

$T_{<5,\,0>} \circ R_{x\text{-}axis}$ $T_{<-5,\,0>} \circ R_{x\text{-}axis}$ $T_{<5,\,0>} \circ R_{y\text{-}axis}$ $T_{<-5,\,0>} \circ R_{y\text{-}axis}$

## Problem 4 Verifying the SAS Postulate

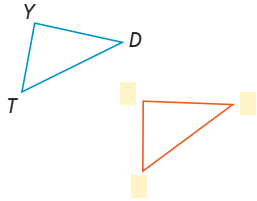



**Got It?** **Verify the SSS Postulate.**

**Given:** $\overline{TD} \cong \overline{EN}$, $\overline{YT} \cong \overline{SE}$, $\overline{YD} \cong \overline{SN}$

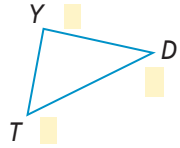
**Prove:** $\Delta YDT \cong \Delta SNE$

**Fill in the blanks to complete each sentence and diagram.**




**15.** Step 1: Rotate $\Delta SNE$ about point ____ so that $\overline{NE}$ is parallel to ____.

**16.** Step 2: Translate $\Delta SNE$ so that points $S$ and ____ coincide.




**Underline the correct choice to complete each sentence.**

**17.** There is / is not a congruence transformation that maps $\Delta SNE$ onto $\Delta YDT$, so $\Delta YDT \approx / \neq / \cong \Delta SNE$. This verifies the ASA/ SSA / SSS / AAS postulate.

## Lesson Check • Do you UNDERSTAND?

**Reasoning** **Is a composition of a rotation followed by a glide reflection a congruence transformation? Explain.**

**18.** List the four isometries on the line below.

_____

**19.** Fill in the blank to complete the sentence.

The composition of two or more isometries is an _____.

**20.** Is a composition of a rotation followed by a glide reflection a congruence transformation? Explain on the lines below.

_____

_____

_____

## Math Success

**Check off the vocabulary words that you understand.**

☐ congruence transformation ☐ congruent

**Rate how well you can *use congruence transformations*.**

Need to review 0 2 4 6 8 10 Now I get it!